Spring Development (No.) 574

DEFINITION

Utilizing springs and seeps to provide water for conservation need.

PURPOSES

This practice may be applied as part of a conservation system to support one or more of the following purposes:

- Improve the distribution of water.
- Increase the quantity and quality of water for livestock, wildlife, or other uses.
- Obtain water for irrigation if water is available in a suitable quantity and quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where spring or seep development will provide a dependable supply of suitable water for the planned times of use, and where the intended purpose can be achieved by using this practice alone or combined with other conservation practices.

CRITERIA

General Criteria Applicable to All Purposes

Spring developments shall be planned, designed, and installed to meet all Federal, State, Local, and Tribal laws and regulations.

Impacts to existing wetland functions shall be assessed. USDA wetland conservation provisions apply. The practice must comply with NRCS wetland technical assistance policy contained in GM 190, Part 410.26 and National Food Security Act Manual, 3rd edition.

The landowner is responsible for obtaining any State, Federal, and local permits where applicable.

An investigation of site conditions, including soil borings, shall be made. Water quality shall be determined to the extent required for the intended purpose. Water quantity shall be measured from existing flows, as practicable, to determine if the development will meet requirements.

Fracture and tubular springs. This type of spring is associated with cavernous rock. If water issues from rock fractures, the individual openings shall be cleaned and enlarged, as needed, to improve flow. The water from these individual openings shall be collected by means of tile or perforated pipeline or by a gravel-filled trench. The collection works shall be constructed an adequate distance below the elevation of the openings to permit free discharge.

If water issues from a single opening, such as a solution channel in a soluble rock formation or a tunnel in lava, the opening shall be cleaned or enlarged as needed. A collection system usually is not required.

If a spring box or sump is used, it shall be installed at an elevation low enough that water will not pond over the spring opening to a depth that will restrict the yield.

Perched or contact springs. Perched or contact springs occur when an impermeable layer lies beneath a water-bearing permeable layer. Collection trenches shall be used to intercept and divert flows from the water-bearing formation.

Artesian springs. Artesian springs normally occur at a fissure or break in the impervious stratum with the water source being an under-lying pervious water-bearing layer so positioned that the water surface elevation (water table) is always above the outlet point of the spring. Remove obstructions, clean or enlarge joints or fractures, or lower the outlet elevation as needed to improve flow. Sumps or spring boxes shall be located as needed. Free outlet discharge or minimum restriction to the spring flow is

required to protect and maintain yield. Ponding over the spring outlet shall be minimized.

Collection systems. If a collection trench is used, the trench shall be excavated so that it extends into the impervious layer. Minimum length of the trench shall be based on site conditions and pipe length to collect the amount of needed water, preferably the entire length of the water-bearing outcrop.

A cutoff wall shall be constructed along the downstream side of the trench if needed to ensure that the flow enters the collection system. The cutoff wall may be constructed of plastic sheeting, well-tamped clay, masonry, concrete, or other impervious materials.

The collection system shall consist of subsurface drainage tubing or perforated pipe not less than 4-inch diameter, wood box drain, or other suitable manufactured system. Surrounding the collector with geotextile fabric or a sand-gravel filter is recommended. Cleanouts are recommended for all collection systems.

Crushed rock or gravel backfill, not less than 1-foot thick (0.3 m), may be used as a collection system if site conditions warrant, in lieu of other materials.

Sand, gravel, and crushed rock shall be composed of clean, hard, durable particles.

Spring boxes. Spring boxes, if needed, shall be made of plastic, concrete, or other durable material, with a tight access cover and impervious floor. A "shoebox" type access cover or manhole attachment, with gasket, is recommended for tightness. The base of the spring boxes shall be concrete unless the underlying material is stable and impervious, or if inflow is from the bottom.

The boxes shall have a minimum cross-sectional area of 1½ ft^2 (0.5m), and the floor of the box shall be not less than 6 inches (150 mm) below the outlet of the collection system.

Spring box overflows, if needed, shall meet the requirements found in NRCS Conservation Practice Standard 614, Watering Facility.

Flow controllers/restrictors on pipelines and/or floats shall be used as needed to reduce water withdrawn from the spring. If applicable, overflow water shall be returned to the spring site.

Outlets. The outlet pipe from a spring box shall be placed not less than 6 inches (150 mm) above the base to provide a sediment trap. The spring outlet pipe should be at the same elevation or lower than the collector pipe outlet to prevent reduced spring flow. The intake to the outlet pipe shall be screened as necessary, and installed to the box with a watertight connection.

The outlet pipe must have positive grade away from the spring box or collection system unless vent pipe(s) are added to prevent air locks.

Shut off valve and/or a vent system shall be included on the spring outlet pipe for winter shutdown, flow control, and system maintenance.

The outlet pipe shall have a minimum 1¼-inch (32-mm) diameter. In lieu of site-specific spring flow and pipe vent calculations, the outlet pipe shall have the following minimum size based on line grades:

1. 1¼ inches (32 mm) inside diameter for line grades greater than 1.0 percent.

2. 1½ inches inside diameter for line grades greater than or equal to 0.5 percent but less than or equal to 1.0 percent.

3. 2 inches inside diameter for line grades less than 0.5 percent.

Pipe beyond 3 feet (0.9 m) from the outlet may be sized per applicable criteria in NRCS Conservation Practice Standard 516, Pipeline.

Minimum outlet pipe material and strength requirements shall equal those found in NRCS Conservation Practice Standard 516, Pipeline.

Where there is no spring box or the spring box is covered and air tight, care must be taken to not have any reverse grade in the outlet pipe and/or to add a vent pipe at the upstream end to prevent air locks.

Appurtenance Protection. Measures shall be included to protect appurtenances from damage by freezing, flooding, sedimentation, contamination, vehicular traffic, and livestock.

Wildlife Habitat Protection. Spring developments with potential to jeopardize wetlands, bogs, fens, threatened and endangered species, or other unique ecological sites shall be designed with measures required to maintain the existing habitat, unless acceptable mitigation is provided. A functional assessment will be made at potential spring development areas to determine existing ecological functions and/or potential losses.

Operation and maintenance plans for ecologically sensitive sites shall include specific valve installation and operation requirements to protect existing site habitat values.

Vegetation Criteria. Disturbed areas shall be established with vegetation or otherwise stabilized as soon as practical after construction. Seedbed preparation, seeding, fertilizing, and mulching shall conform to NRCS Conservation Practice Standard 342, Critical Area Planting.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species, for plant materials identified as invasive species.

CONSIDERATIONS

Consider the potential effects of installation and operation of the spring development on cultural, archaeological, historic and economic resources.

Considerations when determining the suitability of a site for development shall include the need and feasibility of protection from flooding, sedimentation, contaminants, and potential damage to wetlands, woody cover, and existing wildlife habitat.

Native vegetation adapted to wet conditions may be used as an alternative to introduced grasses on some wet sites.

Exclusion fencing should be considered in areas that are seasonally wet and/or to reduce trampling by livestock and wildlife. Fence construction shall be in accordance with NRCS Conservation Practice Standard 382, Fence.

The impact of water available at remote sites is a factor in keeping livestock out of water courses, with the resulting reduction in erosion, sediment yield, and the direct deposit of manure in these water courses.

Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution will be minimized and held within acceptable limits.

Construction methods that enhance wildlife will be used where practical. Trees, stumps, and brush removed from the construction area may be piled for wildlife habitat when approved by the landowner/user.

PLANS AND SPECIFICATIONS

Plans and specifications for installing spring developments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. If the spring development is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will also be conveyed on the plans.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Conservation Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements and site constraints, where applicable

  - Soils/subsurface investigation report, where applicable
  - Water quality testing report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
  - Location map
  - "Designed by" and "Checked by" names or initials
  - Approval signature
  - Job class designation
  - Initials from pre-construction conference
  - As-built notes
- Construction inspection records
  - Conservation Assistance notes or separate inspection records
  - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

OPERATION AND MAINTENANCE

An Operation and Maintenance plan specific to the spring development installed shall be prepared for use by the landowner or responsible operator. The plan should provide specific instructions for operating and maintaining facilities to ensure the spring development functions properly. The plan shall include provisions to address the following, as a minimum:

- The plan shall provide specific instructions for operating and maintaining the system to ensure that it functions properly.

- It shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

- Inspect the system for sudden changes in quantity of water received from the source.

- Checking for debris, minerals, algae and other materials that may restrict system flow.

- Maintain erosion protection at outlets.

- Winterizing and freezing protection guidance shall be given.

- Sediment removal from the spring box shall be done annually.

- Springs shall be protected from flooding, overflow and uncontrolled access by livestock and wildlife.

- Inspections of valve operations shall be done periodically.

- Repair all broken appurtenances or rodent damage to the system promptly to ensure proper functioning.

- Maintaining vegetative cover around the spring area.

REFERENCES

National Engineering Handbook - Part 650 - Engineering Field Handbook, Chapter 12, Springs and Wells

Missouri Livestock Watering Systems Handbook, Chapter 8, Pipeline System Accessories